SOILutions

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SOIL COMPACTION: Fact or Fiction

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Head, Soil Improvement Section

Is subsoil compaction limiting profits on my farm? This is a question many farmers are asking themselves. Low grain prices are forcing producers to look at their operations and identify factors that may be reducing profits.

Articles in farm papers, machinery salesmen extolling the virtues of subsoiling, and research and demonstration trials have all increased awareness of the potential for subsoil compaction to restrict water and root penetration of the subsoil and hence crop yields and profitability of the farm operation.

Introduction of larger tractors, combines and trucks have also prompted many farmers to question if their farming practices are resulting in subsoil compaction. This is the first of three articles which will look at the soil types where research has shown subsoiling may result in increased yields and the role of field operations in causing or alleviating soil compaction.

SOLONETZIC SOILS

Solonetzic soils are often referred to as "gumbo" soils by farmers. Chemically speaking, the ratio of sodium to calcium and magnesium adsorbed on the surfaces of clay particles in a solonetzic soil is considerably higher than in an ordinary soil. It is this adsorbed sodium that causes a hardpan to form in the subsoil. The hardpan or Bnt horizon is characterized by a columnar structure which swells and prevents water moving downward when wet and becomes very hard when dry.

Cont. Page 2

CROP DIAGNOSTIC TOOLS The Next Step

Len Kryzanowski
Crop Nutrition Agronomist

Diagnosis of crop related problems is not an easy process. It is very difficult to get a precise answer from a growing crop as to the cause of observed poor growth. Visual symptoms can sometimes provide clues, but collecting soil and plant samples for laboratory analysis has been the traditional means of diagnosing problems.

Unfortunetaly, the time required for analysis and interpretation usually delays corrective action until the next crop year. Which of course raises the question: Would earlier detection of soil related crop problems permit corrective action in the current crop? The typical answer has been no. In a recent article in the Western Producer, Geza Racz, head of the University of Manitoba's Soil Science department, indicated that, "the current system of collecting soil samples from the field and carting them off to a laboratory takes too much time and labour. Many times the producer wants answers here and now (but) this process can take four or five days." So there lies the conundrum. You aren't aware of the problem until the symptoms appear, and by the time the diagnosis is confirmed by analysis, it's too late to act.

But what if the analysis could be made in the field without the delay of sending samples to a laboratory, then immediate treatment of crop problems may be possible. Recent research work with post emergent fertilizers and fungicides has indicated that a window of opportunity for correction of

Cont. Page 2

THIS ISSUE:

Alberta Agriculture

Solonetzic soils are very common in east-central Alberta from Vegreville in the north to Brooks in the south and in central Alberta from Camrose and Wetaskiwin through Edmonton up to Westlock and Barrhead. Many of the soils in the Peace region also exhibit solonetzic tendencies. Pockets of these soils may also occur in other areas; however, their small size does not allow them to be identified on soil survey maps.

Areas of fields with poor soil tilth may be solonetzic and a farmer should request a soil specialist, district agriculturist or industry agronomist to check it out. Over a hundred deep plowing and subsoiling trials have already been initiated in Alberta. There purpose is to identify the soils most likely to respond to deep tillage, to determine crop response, and to determine the longevity of the beneficial effects.

Deep plowing has not progressed beyond the demonstration phase for the most part, but subsoiling has gained rapid acceptance by farmers. Subsoiling trials, at approximately 50 locations throughout Alberta, allow us to make the following general observations:

✦Response to subsoiling is greatest in years when drought or excess precipitation reduces yields.

✦Crop response is generally proportional to available moisture. Increases in wheat yields average 3 bu/ac in the Brown soil zone up to 7 bu/ac in the Black soil zone.

✦If a soil is suitable for subsoiling, long-term increases in yields can be expected. One of the first trials has been continuously cropped for 23 years with no evidence of the hardpan reforming.

✦The subsoil must be dry to thoroughly shatter the hardpan. Hay or pastureland which is to be worked down usually provide ideal conditions since the subsoil is dry and adequate time is available to "firm" the soil and prepare a seedbed for the following crop. Fields cropped to cereals or oilseeds may provide good conditions provided late summer or fall precipitation has not penetrated into the hardpan. Subsoiling fallowed land is not recommended.

✦Substantial mixing of the surface and subsurface horizons can be achieved with subsoiling. This can alleviate acidic conditions at the surface. On some soils, changes in pH have been as large as 0.5 units. The liming effect may allow the growth of crops previously excluded from the rotation.

Further information on subsoiling is presented in the factsheet "Management of Solonetzic Soils" Agdex 518-8 which is available from district extension offices.✿

nutrional and disease problems does exist but is not long enough to accomodate a delay of a week or more for lab analysis . So taking advantage of this window of opportunity would require the development of portable instruments for use in the field. In fact, such tools are being developed.

Last March, an international conference, "Agriculture Links Up With Space," was held to demonstrate the use of remote sensing in Agriculture. An interesting presentation was made by Frank Lamb, an Oregon farmer who makes use of remote sensing data for monitoring his crops' progress through the growing season and to identify problem areas. The major drawbacks of this technology is poor weather conditions for the satellite imagery, the satellite orbit schedule and the time delay to acquire the data.

As a potential solution to this type of problem, a Calgary based company, ITRES Research, made a presentation on the use of CASI (Compact Airborne Spectrographic Imager). CASI uses aircraft rather than satellites to collect data. The advantages of this system are obvious: better scheduling of flight times, reduced influence of weather conditions by operating under cloud cover, rapid data transfer, plus higher resolution and greater sensitivity than civilian satellite imagery. This type of system could potentially be developed as a diagnostic tool to quickly identify areas of poor crop growth during the growing season. Even if the remote sensing scans could not identify the cause of poor crop growth, they would allow farmers to zero in on problem areas and then apply conventional diagnostic tools.

Tissue tests are a rapid means for determining nutrient elements in the plant sap of fresh tissue in the field but they are only semiquantitative, indicating low, medium or high test results. Part of the problem lies in the fact that nutrient concentration in plant material is greatly affected by stage of plant growth and is further complicated by a need to sample certain parts of the plants. Alternatively, total analysis in the lab, traditionally performed through digestion with hot concentrated acids, is a precise quantitative measurement of nutrient concentrations, but it is also more time consuming and the interpretation is more complex.

An alternative method, NIRS (Near-Infrared Reflectance Spectroscopy), has been widely accepted as a means of plant tissue analysis in laboratories. NIRS quantifies the chemical composition of a sample by measuring the near infrared diffuse reflectance of a sample. It has been applied to the analysis of constituents such as protein, moisture,

Unless you're the lead horse, the view doesn't change much.

-Welsh Proverb

phosphorus, etc. NIRS has even been used on soil to measure moisture, total carbon and total nitrogen. NIRS instruments are not restricted to laboratory use but can be placed in mobile vans and used at field sites. For example, mobile units are widely used for on the spot analysis of hay quality at auctions.

The problem of interpreting plant tissue data has resulted in the development of various systems or guidelines. The traditional approach is to identify the Critical Nutrient Concentration (CNC), the point where the individual plant- nutrient concentration changes from deficient to adequate. This technique is highly dependent upon the stage of growth at time of sampling and the part of the plant sampled.

A newer approach is the Diagnosis and Recommendation Integrated System (DRIS). DRIS is a comprehensive system which identifies all the nutritional factors limiting crop production and compares nutrient ratios in the sample to a set of standard values for the region or DRIS norms. DRIS is generally performed on whole plant samples and is relatively insensitive to growth stage. However, extensive calibration work is required to generate the norms.

Portable soil test equipment also exists and is available on the market. Hach, an American company has marketed simple soil test kits for years. These employ premeasured reagent pillows to perform colorimetric spot tests where the amount of nutrient present is proportional to the intensity of color development. Hach recently came out with a portable spectrophotometer, the DR2000, which according to their literature, "combines microprocessor technology, sophisticated optics and complete system support to make colorimetric analysis easier." The DR2000 has calibrations for over 120 analyses permanently stored in ROM and will allow up to 50 calibrations to be added by the user. The menu of ROM calibrations includes many of the macro and micro nutrients as well as some environmentally sensitive elements and compounds. HACH can even provide a portable digestion apparatus to digest many organic and mineral samples. They have extensive documentation outlining their procedures, the accuracy and precision, and claim that the instrument is highly suited for analysis in the field.

Our evaluation of the DR2000 system indicated some problems, including colored extracts due to the presence of soil organics and uncontrollable reactions which produce high blank readings. Some concerns have been expressed that the equipment optics may be too fragile to stand bouncing around in the back of a pickup. So transport to and from the field should proceed very carefully. We found the DR2000 was not accurate enough for our research needs and probably not simple enough to produce accurate results if the operator didn't have at least some chemistry background. It may, however, have a place in the diagnostic kits of knowledgeable farmers or extension agronomists.

A Japanese company, Horiba, has "integrated microprocessors and miniature electronics" to develop a portable ion selective electrode meter designed to fit in the palm of your hand. Meters for sodium, potassium, nitrate and pH are being marketed by Spectrum Technologies, Inc. and are characterized by a flat sensor that requires only a few drops of a solution to make a measurement. Our tests of the nitrate and pH meters indicated some difficulties. The nitrate meter proved to be very inaccurate compared to laboratory analysis. The performance of the pH meter was much more reliable but the reading did tend to drift with time. Calibration of the meters tended to be fairly tricky and the procedures used to obtain a soil extract proved awkward.

In both instances, the evaluation of the portable soil test equipment indicated the need for a solid chemistry and soils background for the individual using the equipment, plus the need for quality control to ensure accurate and reliable results. The use of soil samples with known results as standard to check the equipment and procedures is routine in laboratories and would have to be applied to the portable laboratory. Further development and testing of portable labs will no doubt in time lead to the development of more reliable equipment and procedures.

Once analytical test results have been obtained, the next step is interpretation and recommendation. This can be aided by computerized expert systems. A comprehensive system would theoretically store database information such as soil survey and records of similar type problems and allow input of visual symptoms, management information, soil and/or plant analyses, and geographic information to help diagnose crop problems. The recent development of microcomputers that are both portable and powerful, opens up opportunities for taking computerized expert systems to the field and providing diagnostics and recommendations on site. Expert systems have already been developed for diagnosing crop diseases and various prototype systems for soil fertility recommendations have been tested.

So portable equipment and techniques such as remote sensing, NIRS, colorimetric spectrophotometers, ion selective electrodes and computerized expert systems already exist for diagnosing crop problems. The difficulty lies in ensuring the accuracy of results and the proper use of the technology by individuals who are not extensively trained in sample collection, chemistry, soils and crop production. In addition, an extensive program of field and laboratory calibration must be undertaken in order to develop these new diagnostic tools to their fullest potential.

COPPER OPTIONS

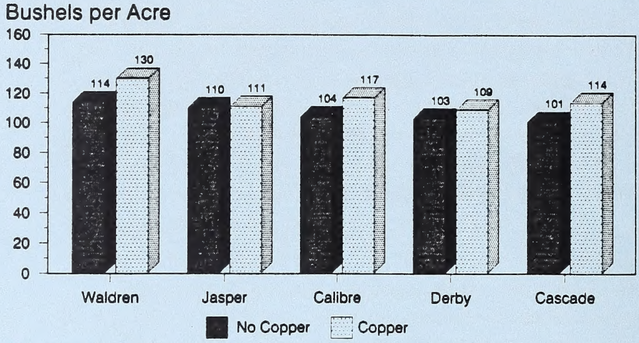
There has been a lot of talk about copper deficiency the last few years and everyone seems to have an opinion. In fact, if you put four agronomists in a copper deficient field you'll end up with five opinions about what should be done. So what management options does a producer have when faced with potentially copper deficient land and limited input resources? To get the most up to date answers, SOILutions recently cornered Elston Solberg, Research Agronomist with Soils Branch. Elston has been working on the copper problem in central Alberta for the last five years. Here's what he had to say.

"We've known for some time that there are big differences between crops. Some tolerate copper deficiency and others don't. Research from Australia, Europe, and the States indicates that tolerance differences between varieties can be as great as between crops. Unfortunately, we had very little data on species and varieties grown in Alberta. So in 1990 we grew five varieties of barley, oats and canola on sites known to be copper deficient for wheat production."

"We were somewhat surprised to find that none of the canola varieties responded to copper fertilizer, suggesting a fairly high tolerance to copper deficiency. The oat site was puzzling in that there were no deficiency symptoms during the growing season, but copper fertilizer increased yields of most varieties (see figure). The barley site was most interesting. There were large differences between varieties in their response to copper fertilization. Duke was little affected while Noble, Virden, Harrington and Condor were hammered in the zero copper plots."

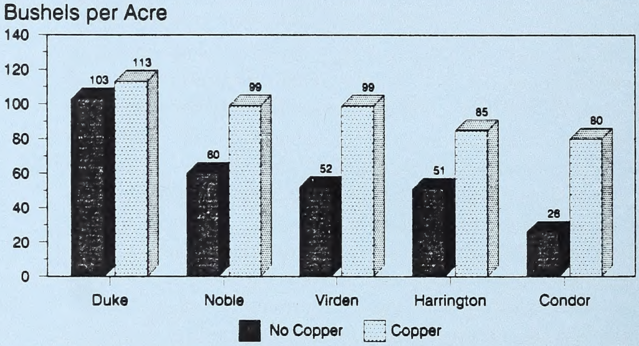
"These initial results indicate that a producer has at least three options when cropping copper deficient land. He can fertilize, he can pick a resistant crop like canola or oats or he can pick a variety within a crop that is relatively resistant (like Duke). Another option available to producers faced with limited input dollars would be to apply a sub-optimum level of copper fertilizer and plant a crop or variety which is resistant to copper deficiency thereby hedging production bets from both ends!"

Response of Five Oat Varieties to Copper
Millet - 1990



Cu at 5 lb/ac as Bluestone in 1988

Response of Five Barley Varieties to Copper
Stony Plain - 1990



Cu at 10 lb/ac as Bluestone in 1987

Most of the existing copper research has been made possible through contributions from industry (Esso, Cominco and Sherritt Gordon), the hard work of research cooperators, and the efforts of many others within P.I.D. In 1991 the copper program will expand through matching funds from Alberta Agricultural Research Institute and a new three year Farming for the Future project. A major component of the new work will examine the response of 6 varieties of wheat, barley, oats and canola at two new sites.

Other aspects include:

❍ Examination of the interactions of disease and herbicide with copper deficiency. Research Cooperators: Ieuan Evans and Denise Maurice, Crop Protection, PID.

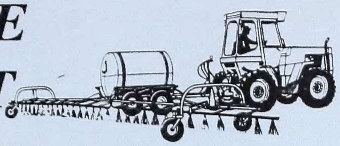
❍ Ranking of wheat varieties from various parts of the world, some thought to contain genes that may control susceptibility to copper deficiency. Research Cooperators: Keith Briggs and James Owuoche, Plant Science, U of A.

❍ Evaluation of rates, method and frequency of application of 3 sources of readily available copper fertilizers.

❍ Investigation of the extent of micronutrient immobilization by various forms of P fertilizer. Research Cooperators: Marvin Nyborg and Reggie Matthews, Soils, U of A.

❍ Continuation of 4 existing trials to determine the residual characteristics of different copper fertilizers and optimal rates of copper sulphate (bluestone).

HERBICIDE RESISTANT WEEDS, A Growing Concern



Denise Maurice, Supervisor,
Weed Research and Development

So over the years you have developed a weed management strategy that works and stuck with it. But, have you noticed a decrease in control with the old reliable herbicides you have been using year after year? Do patches of the field not seem quite as clean as they were several years ago? It could be you have a herbicide resistance problem.

Prior to 1989, herbicide resistance in Canada was confined to the corn growing areas of Quebec and Ontario. Recent evidence indicates that resistance is now a threat to cereal and oilseed production in Western Canada. Last year in Alberta, there were reports of green foxtail resistance to trifluralin (Treflan, Rival, Triflurex, Heritage Fortress), kochia and chickweed resistance to sulfonylureas (Glean, Ally, Refine, Muster), and wild oat resistance to triallate (Avadex BW, Fortress). Researchers in Manitoba have also found wild oat biotypes that are resistant to the dim-fop herbicides (Poast, Fusillade, Hoegrass/Hoegrass II, Triumph Plus, Excel).

Resistance develops as a result of repeated use of the same herbicide or using a rotation of herbicides with the same mechanism of action. Repeated use selects for naturally resistant strains within the target weed population. These resistant strains are not visibly different from the susceptible strains, but they are able to survive the normal rate of herbicide application. Since resistant plants occur at a very low frequency, one in a million, they go undetected at first. Gradually the susceptible strains die out and the resistant strains build up until they dominate the population. That's when noticeable herbicide failure occurs.

If you have a herbicide failure, how can you tell if the failure is truly due to resistant weeds or is a result of other factors such as weather conditions, poor timing, equipment malfunctions etc.? The true test of resistance is to collect seed from suspected resistant strains, grow them under controlled conditions, apply the herbicide, and see if the weed survives. Unfortunately, there is no single fail safe indicator of resistant strains in farm fields, but there are a number of indicators that when looked at collectively can give you a good idea if you have a resistance problem:

The first indicator is declining effectiveness of control of a particular target weed with the same herbicide, but the herbicide is still effective against the other weeds listed on the label. Of course this indicator is meaningless for herbicides, such as triallate, that only control a single species, wild oats.

In the single species case, look for decreasing effectiveness and lack of typical injury symptoms on the surviving plants. For example, wild oat biotypes which are resistant to triallate will not show the typical root pruning symptoms found on susceptible strains.

Also look at the pattern of weed growth. Long narrow strips of poor control across a field are more likely due to a plugged nozzle than a resistant weed. Resistant strains generally show up as patterns that cannot be explained by sprayer failures, poor sprayer clean out, or inadequate incorporation.

Examine the history of herbicide use. Repeated use of the same or chemically related herbicides over a number of years is generally prerequisite to the development of resistance. It also appears as if resistance is more likely and/or develops faster with highly residual herbicides. For example, 4-5 years of continued use of sulfonlyureas (Glean, Ally, Muster, Refine) may be enough to develop resistance in certain broad leaf species; while 10-15 years of continual use of triallate (Avadex BW) or trifluralin (Treflan, Rival, Heritage, Fortress, Triflurex) appears to be necessary for the development of resistant wild oats.

In terms of managing resistant weeds, an ounce of prevention is worth a pound of cure. (That's 28.4 grams is worth 0.454 kilograms for those who insist on metric.) Early recognition isthe key to effective weed control, but survey data indicates weed problems are not generally recognized until 30% of the field is infested. Keep a closer watch on the weeds in your fields. Don't let a resistant weed take over a field and spread to other fields before you act.

Accurate field records are a must. Record herbicide application and performance history as well as keeping notes on the distribution pattern of weeds in the field. This will allow you to monitor population changes.

Continue to use crop rotations as part of your weed management strategy, but also incorporate herbicide rotation into your program. The herbicide rotation should involve not just changing products, but changing to a product from a different chemical group. For example, Fortress, which is registered for control of green foxtail in wheat, contains both trifluralin and triallate. Rotating into canola and using Treflan, Rival or Triflurex all of which contains trifluralin will not help prevent the development of a resistant green foxtail population.

A second tactic is to attack with a tank mix of products from different chemical groups with different modes of action. Although the target weed may be resistant to the first herbicide, it will be controlled by the second, thus preventing the build up of resistant populations. For example, a tank mix of Ally and 2,4-D could be used to prevent the build up of sulfonylurea resistant kochia in cereals.

Continue to use cultural techniques, such as timely tillage, they are a vital weapon in your weed management strategy.

If you have checked the list of indicators and are suspicious that you have herbicide resistant weeds on your farm contact your D.A. or provincial weed specialist. And remember prevention is the key, *so start rotating those herbicides!*

You've got to do your own growing, no matter how tall your grandfather was.

-Irish Proverb

INTENSIVE MANAGEMENT UNDER IRRIGATION

R.H. McKenzie and A.B. Middleton
Soils Branch, Lethbridge

In the mid 80's, many North American researchers were keenly interested in the new concepts of Intensive Crop Management (ICM) and Maximum Economic Yield (MEY). Application of ICM technology had dramatically increased cereal yields in Europe during the late 70's. Researchers were wondering if application of the ICM and MEY under North American conditions would help reduce per unit costs and increase the profitability of crop production.

Simply put, ICM or MEY is a production management system that integrates all the latest technology that is appropriate under the climate and soil conditions at a particular site. It includes the use of the best cultivars, increased seeding rates, more efficient fertilizer programs, control of insects, diseases, weeds, and the use of plant growth regulators.

In southern Alberta, ICM research had received little attention prior to 1986. We did some preliminary work that year, then, ran a 4 year Farming for the Future project (#87-167) from 1987 to 1990. This multi-component field study measured the effects of soil fertility levels, plant populations, plant growth regulators, fungicides and micronutrients on yield and quality of several crops. Crops studied were Fielder soft white spring wheat, Katepwa hard red spring wheat, Harrington 2 row malt barley, Samson 6-row feed barley, and 2 canola varieties. All crops were grown in rotation under irrigation at both Lethbridge and Vauxhall, Alberta. A number of general observations were made:

- The use of high fertility alone or in combination with other ICM inputs resulted in a marked increase in soil nitrate over four years. Nitrate contamination of ground and surface waters is a growing environmental concern. Therefore, the practice of applying large amounts of N fertilizer may be questionable.

- Environmental conditions varied from year to year and dramatically influenced crop yield and response to the various ICM inputs. The full ICM treatment frequently produced the highest yields; however, the yield increase over the normal fertility treatment was generally less than 10 to 15%. Although full ICM increased gross production, low grain prices coupled with the relatively high cost of the intensive management inputs made for a poor economic performance.

- High fertility and high plant populations were the two inputs which appeared to have the most positive effect on increasing crop yield.

- The plant growth regulator used for wheat and barley was generally quite effective in reducing crop height and preventing lodging. It also delayed crop maturity by 5 to 7 days. Lodging was not a problem with either soft or hard spring wheat or with Samson barley. It was a problem with Harrington barley. In a few cases, the plant growth regulator significantly increased crop yield. The fungicide used for cereals was visually effective in suppressing disease. However, with the hot dry summers and low humidity, disease levels were minimal.

- Several plant growth regulators were tried with canola, but none reduced crop height, lodging or contributed to increased yield. Disease levels in canola were low and therefore, the fungicide did not affect yield. The use of fungicides may be beneficial when disease pressures are high.

- Farmers considering the use of growth regulators or fungicides should adopt a scouting program to determine the potential for lodging and for disease detection. When potential problems are observed, necessary action can be taken. However, the use of these products would be the exception rather than the rule.

- The use of additional potassium, sulfur, and micronutrient fertilizers did not significantly contribute to increased crop yield or quality nor did they reduce lodging or disease pressure in any crop, in any year at either site.

If you would like a copy of our summary report or have questions on this work feel free to contact us in Lethbridge at 381-5126.✶

PLANNING A PLOT TOUR THIS SUMMER?

Soils Branch has over 100 experiments in the field this summer. In central Alberta, we have plots at Cooking Lake, Josephburg, Legal, Stony Plain, Millet, Bearhills, Rimbey, Eckville, Tofield, Mundare, Lamont, Wainwright, Amisk, Grassland, Plamonden, Hylo, Athabasca, Westlock, Breton, and Ellerslie. If you or your group are interested in visiting these locations call Jill Demulder or Elston Solberg (427-2530) for details. In Southern Alberta, contact Ross McKenzie (381-5126) for location and details and in the Peace, Garry Coy (835-2291).

SOIL SEARCHING

DEGRADATION - RESEARCHERS - ISSUES

Whichever Way the Wind Blows

In the beginning, a few soil scientists such as Dr. Don Rennie attempted to draw public attention to some important soil degradation issues. The issues were given a higher profile when Senator Sparrow joined the campaign. Then came the zealous environmentalists including David Suzuki. What has been the result? The public has been told and apparently believes that our soil resources are being devastated by current agricultural management practices. The original focus on specific soil degradation issues (i.e., erosion, salinization, and organic matter depletion) has been lost. The public is becoming convinced that all or most soil/crop management practices are non-sustainable, produce unsafe or poor quality food and cause serious harm to our soil resources and the environment.

The original "cause" was noble. The effort to draw attention to specific soil degradation issues was much needed and has produced results. The public money-tree was shaken with considerable success especially considering fiscal restraint. But before we become too self- congratulatory of our success in creating public awareness and money for initiatives to save our soil resources, let's take a closer look at where this process is leading.

Generally society responds to scientific issues with socio-political consequences by throwing money. Once the money gets thrown , it creates a mad scramble among bureaucracies, research institutions and scientists to become involved and generates a flurry of proposals, new programs, research projects, etc. As often as not, the scramble starts before the issues are clearly defined and there are no commonly held terms of reference or priorities that can serve as a basis for evaluating programs and projects. If the issues are not clearly defined and priorities set, it is inevitable that resources provided to address the problems will be used inefficiently.

By not defining the issues in soil degradation, we have tacitly accepted the premise that all or most conventional management practices are degrading the soil and environment, are non-sustainable, and cannot be part of the solution. We accept this premise without requiring the supporting scientific evidence. In some cases, we accept, in contradiction to the evidence. As a result, the development and improvement of technologies we know something about are ignored and we focus on higher risk (with respect to the probability of success) and more costly alternatives.

For better or worse, the process of determining agricultural research priorities has changed. When researchers had access to line funding, they used scientific information and their contact with producers and agri-business to identify issues that needed study. Line funding of research has virtually dissappeared and scientists have become chasers of grant money with the granting agencies determining research priorities.

With respect to soils research, the result has been to focus funding on conservation, degradation, and environmental problems and treat them as issues that can be viewed in isolation from production. Fortunately for production agriculture, producer groups and agri-business have become more involved in funding research. Also funding agencies such as Farming for the Future have producers on their advisory committees which has helped to maintain a more balanced agenda.

The management of soil and water resources and the technologies used to produce food are under close public scrutiny. From the initial thrust aimed at drawing attention to specific soil degradation issues, the message has been falsely generalized to read that all or most soil/crop management practices are harmful.

So where are the agricultural policy makers and scientists who should be saying whoa, let's proceed on the basis of what science indicates may be the issues? Their numbers are few. However, if we don't get involved, how will the public become sufficiently informed to separate fact from fiction. Public opinion must play a role in setting priorities for publicly funded programs but it will only be a constructive role if we have a well informed public.

Are scientists being relegated or relagating themselves to a role of chasing research grants and researching whatever the money dictates? Hopefully not, but there is certainly reason for concern. In the current climate, where almost every aspect of conventional agriculture is being identified as a problem or issue, there is an urgent need to apply scientific knowledge and critical thinking towards the end of separating real issues from rhetoric. I think it is time that agricultural policy makers and scientists asked themselves, do I go with the flow, chase research grant money, and help build yet another befuddled bureaucracy, or do I provide leadership and influence the process by making sure issues are clearly defined, priorities set, and problems attacked from a solid foundation.

Doug Penney
Soils Branch

Next issue: Production Efficiency, not a hot topic. But when the sustainability and environment smoke clears, will we still be able to compete?

LAB NOTEBOOK

During the 1980's, the Agricultural Soil and Animal Nutrition Laboratory evolved from a laboratory whose main function was providing analyses and recommendations to producers in a fee for service environment to one primarily involved in research, development, and diagnostics. Today's ASANL has four strategic goals:

*Participate as an active partner in applied research.

*Develop new laboratory methodologies in soil, plant and feed analyses.

*Transfer research and development results to producers, private sector laboratories, and agribusiness.

*Maintain quality services for producers.

All these goals are important, but it is the research function that now consumes most of ASANL's human and material resources. This year, ASANL will be involved in approximately 50 major and 150 minor research and demonstration projects in the areas of crop production, soil conservation, and animal nutrition. Involvement ranges from simply providing analyses to full partnershp. Research partners include staff from Alberta Agriculture, University of Alberta, Agriculture Canada, applied research associations, and agribussiness.

In order to improve the quality of service provided to clients and partners, ASANL has initiated a number of inhouse technical projects which include:

*Development of an analytical services guide. This will provide clients with detailed listing of methodologies, appropriate applications for each method, expected levels of accuracy and precision, and reference citations required for client publications.

*Upgrading the Quality Assurance/Quality Control program. This project involves education of ASANL staff in the philosophy and methodology of QA/QC, development of more appropriate standard samples, and computerization of QC charting processes. In future, clients will be provided with accuracy and precision values that will help them interpret data.

*Development of electronic research and diagnostic reports. ASANL can now provide research data reports as a LOTUS file on disk. Further work is planned to improve data delivery using electronic mail, modem, fax, and floppy disk.

*Continued development of new research methodolgies. Some of the projects in this area include: Development of NIR applications for amino acid analysis of grains and forages and oil content of oil seed crops. Modification of methods for determining N mineralization potential and P characterization for application to research and demonstration projects.

If you have questions or suggestions concerning ASANL services please call Dan Heaney or Ed Redshaw at 427-6361.

FUNDAMENTAL BREAKTHROUGH, HEAVIEST ELEMENT DISCOVERED

Thomas G. Kyle
Los Alamos, New Mexico

The heaviest element known to science was recently discovered in one of the national laboratories. The element tentatively named administratium (Ad), has no electrons or protons, thus having atomic number zero. It does, however, have one neutron, 75 associate neutrons, 125 deputy neutrons, and 11 assistant deputy associate neutrons. This gives it an atomic mass of 312. The 312 particles are held together in the nucleus by a force that involves the continual exchange of mesonlike particles called memoons.

Since it has no electrons, administratium is inert. Nevertheless it can be detected chemically because it seems to impede every reaction in which it takes part. According to Dr. M. Langour, one of the discoverers of the element, a very small amount of adminstratium caused one reaction that normally occurs in less than a second to require over four days to go to completion.

Administratium has a half-life of approximately 3 years, at which time it does not actually decay. Instead it undergoes an internal reorganization in which associates to the neutron, deputy associates to the neutron, and assistant deputy associates to the neutron all exchange places. A tendancy has been observed for the atomic mass to actually increase during each reorganization.

SOILutions is published quarterly by Soils Branch, Alberta Agriculture. Your comments on current contents, ideas and contributions for future articles are welcome. For further information phone, fax, or write *Dan Heaney*, Soil and Animal Nutrition Laboratory, 905 O.S. Longman Bldg., 6909-116 st, Edmonton, Alberta, T6H 4P2, Phone (403)427-6361, Fax (403) 427-1439 **OR** *Elston Solberg*, Soils Branch, J.G. O'Donoghue Bldg., 7000-113 st, Edmonton, Alberta, T6H 5T6. Phone (403) 427-2530, Fax (403) 422-9745.